

Animal Models of Physical and Social Environmental Stress

The search to understand human health effects of environmental agents at all levels—molecular, cellular, organ, individual, and population—is hampered by a lack of specific model systems in which to carry out scientific investigations. In the past, assessment of potential adverse health effects of chemicals has been accomplished largely by tests utilizing laboratory animals. Both eukaryotic and prokaryotic cell culture models have been developed to elucidate molecular mechanisms by which physical and chemical environmental exposures activate or deregulate molecular pathways leading to disease outcomes. However, methods and models that can be employed to investigate how similar biological pathways are affected by exposures related to the social environment have not been as clearly defined.



The NIEHS is initiating programs that foster the use of animal models to study how social environmental stressors may activate or stimulate molecular pathways that can lead to disease states. Recent NIEHS scientific retreats have featured sessions on animal models of physical and social environmental stress (see, for example, “DERT Annual Scientific Retreat,” *EHP* 110:A207 [2002], available online at <http://ehpnet1.niehs.nih.gov/docs/2002/110-4/extram-speaking.html>). Topics discussed during these sessions have included behavioral, neurochemical, and immunological effects of both social and physical stressors. For example, atherosclerosis induction by moderate hyperlipoproteinemia in group-housed cynomolgus macaques differs markedly in animals of dominant versus subordinate social status. Both rodent and primate studies reveal differential susceptibility to adenovirus infection and subsequent development of a biologically definable infection that is dependent on rank or social stature in the dominance hierarchy of the animal colonies. Such results suggest that social or psychosocial stress can affect immune function and lead to increased vulnerability to illness. These interactions may be crucial in addressing health problems associated with particular populations, such as individuals or communities of low socioeconomic status.

NIEHS-supported research assessing the contributions of the social environment (neighborhood characteristics, socioeconomic status, psychosocial stress, occupational hierarchy, race and gender discrimination, and social trust) has not focused on the use of animal models. The recent NIEHS-led trans-NIH solicitation ES-02-009, “Centers for Population Health and Health Disparities,” is the first specific initiative that seeks to stimulate the use of animal models in investigating the contributions of social environmental factors to the activation of molecular pathways predisposing or leading to disease development. In addition, individual investigators are now actively encouraged to develop and utilize a variety of animal models to enhance our understanding of the biological and behavioral mechanisms by which both social and physical environmental influences can affect health status.

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